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Achsah Philip

Dated: April 8, 2014

EXPANSION OF THE ANTICOAGULATION CENTER THROUGH INCREASED UTILIZATION OF OUTPATIENT PHARMACISTS

by

ACHSAH SAMUEL PHILIP

A project submitted in partial fulfillment of
the requirement for the degree of

MASTER OF SCIENCE

IN

PHARMACY ADMINISTRATION

Non-Thesis Project Option

University of Houston
College of Pharmacy

Graduation Date:
May 9, 2014

Expansion of the anticoagulation center through increased utilization of outpatient pharmacists

To the Faculty of the University of Houston, College of Pharmacy:

The members of the committee appointed to examine the project of Achsah Philip find it satisfactory and recommend that it be accepted on April 8, 2014

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Masters Research Project

Title: Expansion of the anticoagulation center through increased utilization of outpatient pharmacists

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Abstract:

Outcomes associated with a pilot involving aspects of a patient-centered pharmacy practice model

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Background: Over 2,300 patients were seen in the Harris Health System for anticoagulation management in 2012. Due to high patient volume and limited appointments, many patients cannot be seen in a timely manner. Efforts have been made to increase anticoagulation visits, such as increasing the number of appointments for clinical pharmacy specialists (CLPS). Also, a telephone management service was established for clinical staff pharmacists (CSPs) to provide anticoagulation management.

Objective: The primary objective is to assess the total number of visits per month before and after increased pharmacist utilization. Secondary objectives include time to 3rd available appointment, proportion of patients in therapeutic range at 30 days, and 30 day readmission due to anticoagulation adverse effects pre and post intervention.

Methods: Prior to the initiation of the study, Institutional Review Board (IRB) approval was obtained, along with a waiver of informed consent. This is a retrospective cohort study using a quasi-experimental design. To be included in this study, patients must have

been seen by the clinical pharmacy specialist. The data will be collected from the time period of October 1, 2011 to April 1, 2014 for four clinics within the Harris Health System. In addition, a secondary analysis will evaluate productivity for the CLPS by evaluating the number of completed publications and projects pre and post intervention. We will also evaluate the pharmacy productivity standards per month for the four piloted clinics pre and post intervention for CSPs.

Results: Piloted clinics increased anticoagulation visits from 134 patients to 143 patients monthly. However, this result was not statically significant. Time to third available appointment decreased from 12 days to 7 days, which was not statistically significant ($p=0.03$). This was due to a noted statistical decrease at the Northwest Clinic. No changes in time in therapeutic range and readmissions were noted. No difference was noted in clinics based on productivity, which was defined as work hours over prescription volume. In addition, no difference was noted on amount of projects completed by CLPS.

Conclusions: Results show increase access to care during the post intervention period. However, visits did not increase as predicted. Time to appointment and high quality clinical outcomes were maintained. More research should be completed to further evaluate expanding coverage through the use of CSPs.

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List of Acronyms:

ASHP: American Society of Health-System Pharmacists
CLPS: Clinical Pharmacy Specialists
CSP: Clinical Staff Pharmacist
PPMI: Pharmacy Practice Model Initiative
EMR: Electronic Medical Record
INR: Internalized Normal Ratio
TTR: Time in Therapeutic Range

Background Information:

Clinical pharmacists play an essential role in the management of patients with chronic diseases by optimizing treatment outcomes. They increase the rate of achieving therapeutic goals and decrease the cost of therapy for both patients and health care settings[1]. For example, a retrospective study performed in the medical home setting showed that patients receiving care from the clinical pharmacist had about a threefold increased likelihood of achieving an A1c less than 7% compared with patients receiving usual care[1]. Another study evaluated a centralized pharmacy specialist–managed program that was successful in assisting patients achieve their lipid goals where 72.9% achieved the LDL-C goal of 100 mg/dL[2] .

Anticoagulation therapy is used in the inpatient and outpatient setting to prevent venous and arterial thrombosis in patients. This includes the use of vitamin K antagonists, such as warfarin and low molecular weight heparin, such as enoxaparin. Treatment goals are set to obtain an INR within therapeutic range. There is a strong association between INR levels outside the therapeutic range and adverse outcomes. An INR of < 2.0 can result in increased risk of ischemic stroke, and an INR of > 4.0 can result in the increased risk of hemorrhage. Therefore, it is essential to maximize the time spent within therapeutic INR range. A wide variation in percentage of TTR, 29%–75%, has been reported[3]. Warfarin use is the one of the most common cause of adverse drug events in emergency rooms with an average risk of major bleeding due to warfarin of 15–20% per year[4]. Therefore, frequent monitoring and therapy adjustment are essential for these patients. However, due

to the complexity of anticoagulation management, many patients are not managed appropriately. Clinical pharmacy services have shown to be effective in anticoagulation monitoring[5]. Clinical pharmacists have been shown to be equal or superior to experienced physicians and other healthcare providers in managing patients on warfarin[5]. A study conducted at Kaiser Permanente Colorado Region compared patients whose anticoagulation therapy was managed by a physician group vs. a telephone service provided by the Clinical Pharmacy Anticoagulation Service[5]. The study concluded that using the telephone service resulted in a higher likelihood of achieving target INR range (63.5%) compared to the control group (55.2%) and reduced the risk of major bleeding[5].

While clinical pharmacy services have shown great potential, certain limitations still remain as pharmacists are faced with a number of challenges. A study conducted at Veteran Health Affairs mentioned that limitations included: lack of time; high workload; staff shortages; compensation issues and poor physician collaboration[6]. Some of these limitations can be seen within Harris Health system. The Harris Health System is a fully integrated healthcare system which provides patient care for residents of Harris County in and around Houston, Texas. The system includes 16 community health centers and two full-service hospitals. The majority of patients seen within the health system are indigent or charity care. Last year, Harris Health System provided more than $1.25 billion in charity care.

The Harris Health System pharmacy department is comprised of pharmacy technicians, CSPs and CLPS in both the inpatient and outpatient settings. In the outpatient setting,

CLPS provide chronic disease management through face to face patient encounters for chronic diseases including but not limited to, anticoagulation, diabetes, hypertension and hyperlipidema. The CLPS see at least sixteen patients per day. From July 2012 to September 2012 there were over 5,600 outpatient CLPS visits with more than 2,300 of the visits for anticoagulation management. Not all patients are followed up by CLPS in the recommended time frame due to lack of appointment availability secondary to high patient volume. For example, from November 2011 to November 2012 roughly 778 patients were discharged with a warfarin order after leaving the hospital. To appropriately monitor the patient's INR, the individual should be seen within 7 days post discharge. Of these 778 patients only 433 were seen within 7 days. Therefore, roughly 45% of patients were not seen by CLPS within the appropriate time frame. However, due to limitations on funding and space, hiring an increased number of CLPS remains a challenge.

Efforts have been made to increase utilization of pharmacists in the outpatient setting. CLPS in the past did not have scheduled patient visits on Fridays. Fridays were used for staff meetings, student topic discussions, and time allotted to additional projects. To increase visit access, two half days of visits per month were added to the clinic sites to increase appointment availability beginning April 2013. This would allow for an additional 16 to 24 patient visits per month.

CSPs in the outpatient setting provide distributive, dispensing function support for the pharmacy but are underutilized in the clinical role. This differs from the CLPS who see patients face to face. However, with a projected shortage of primary care providers, there

is an unprecedented opportunity for these CSPs to expand access to care in the areas of chronic disease management and preventative medicine.

A recent trial published reviewed anticoagulation clinics in the Veterans Affair health care clinics. The study reviewed clinics which were categorized as low performing clinics or high performing clinics, and analyzed factors that could have contributed to the clinics success or failure[7]. When comparing a clinic visit with a telephone service, the study noted that no difference was displayed.

For this clinical pharmacy service, the clinical outpatient pharmacy team and outpatient pharmacy operations team collaborated to implement a pharmacist telephone encounter service designed to help monitor patients on warfarin. This service was staffed by a CSP.

The telephone clinical program was implemented at Northwest, Strawberry, Settegast, and Acres Clinics within the Harris Health System in April 2013. CLPS trained the CSPs participating in the telephone service on anticoagulation education, therapy adjustments and documentation.

This study is unique in that the clinical pharmacy services provided were conducted by both the clinical pharmacy specialists and clinical staff pharmacists. These services were be provided to the patients of the Harris Health system, who are primarily charity care and the indigent population.

This study assessed the outcomes associated with an anticoagulation service involving increasing utilization of outpatient pharmacists at Acres, Settegast, Northwest and Strawberry clinics.

Objectives:

The objective of this project is to assess if increased utilization of pharmacists, CLPS and CSP, allows for the expansion of the number of anticoagulation visits and expand CSP services.

The specific objectives of this study are to compare the following data pre and post intervention:

Quantitative measures

- Total number of anticoagulation visits per month
- Time to third available appointment
- TTR at 30 days
- Readmission due to thromboembolic event or bleed
- Productivity based on work hours over prescription volume
- Number of projects completed by CLPS

Furthermore, the study will allow the department to identify obstacles and challenges to evaluate the future steps needed for increasing anticoagulation visits through utilization of outpatient pharmacists.

Hypothesis:

This study will show that increased utilization of pharmacy services will increase the number of patient visits by approximately 20%. Also, this study will show that the time to 3rd available appointment, which corresponds to the time until the 3rd next available appointment for CLPS, will not be increased even though new patients are being added. Ultimately, we believe that the changes in time to 3rd available appointment from the current baseline will not be statistically significant. In addition, this study will show there will be no statistically significant difference in the clinical outcomes of patients, productivity of CSP or projects completed by CLPS between the pre intervention and post intervention phases.

Study Design:

This is a retrospective cohort study using a quasi-experimental design, as this design is tailored to evaluate the impact of the composite intervention of increased CSP and CLPS utilization on the given population. We will compare outcomes between two arms (Appendix 1).

Data was collected retrospectively using computerized databases from the time period of October 1, 2011 to April 1, 2014 for the Northwest, Strawberry, Settegast, and Acres Clinics.

Methods:

General:

Computerized databases were used to gather data on anticoagulation visits, time to third available appointment and productivity measures. EMR Chart reviews were conducted on sampled patients to assess time in therapeutic range and readmissions due to thromboembolic event or bleed. CLPS reporting was utilized to assess number of projects completed pre and post intervention. Data was downloaded or documented onto an electronic spreadsheet (MS Excel) and analyzed using Student t tests and chi squared tests for quantitative endpoints.

Inclusion Criteria

Patient seen by CLPS between October 2011 to April 2014

Time period

- The post intervention data was collected from March 1, 2014 to April 1, 2014
- Pre-intervention data was collected 10 days immediately prior to the pilot.

Details of the increased pharmacist utilization intervention

CLPS in the past did not have scheduled patient visits on Fridays. Fridays were used for staff meetings, student topic discussions, and time allotted for additional projects. To increase visit access, two half days of visits per month were added to the clinic sites to

increase appointment availability beginning April 2013. This would allow for an additional 16 to 24 patient visits per month.

When reviewing patients seen by CLPS, it was noticed that a percentage of the patients were chronically managed and therapeutically controlled. For these patients, the clinical outpatient pharmacy team and outpatient pharmacy operations team collaborated to implement a pharmacist telephone encounter service designed to help monitor patients on warfarin beginning April 2013. This service was staffed by CSPs. The CSPs monitored patients who were therapeutically controlled on warfarin therapy for over three months. The telephone visit lasted approximately 15 minutes per patient. Thereafter, the CSP scheduled the patient for a follow up PT/INR and telephone appointment. The CSPs at each clinic site provided the telephone anticoagulation service with a goal of monitoring 10 patients per clinic site. Sponsoring physician agreements, per Texas State Board Rule 295.13 and Texas Medical Examiners Rule 193.7, were signed to allow the clinical staff pharmacists to provide anticoagulation telephone management. Appendix 2 and Appendix 3 illustrates how patients were referred to the telephone management service by CLPS and also, how a patient was returned to CLPS if face to face management was deemed necessary.

Power Analysis

The intervention took place during a period from April 1, 2013 to March 31, 2014.

This study will retrospectively evaluate the effect of these interventions on total number of visits added, time to 3rd available appointment, clinical outcomes, CSP productivity, and CLPS projects completed.

A randomly selected cohort of 50 patients will be evaluated per clinic site post intervention, for a total of 200 patients post intervention. All patients managed by telephone management will be included in the sample. Pre intervention a randomly selected cohort of 75 patients per clinic will be evaluated per clinic for a total of 300 patients pre-intervention. Patients for the telephone management service will be randomly selected and included in the pre intervention group. The total sample size for this project will be 500 patients. To analyze our results we will use a student T test for continuous data and $\chi 2$ tests for categorical data. A p-value of less than <0.05 will be considered statistically significant.

Results:

As shown in Figure 2, across all clinics the total number of visits increased between the two periods. From August 2011 to March 2013, on average the CLPS clinics had 270 visits per month. An overall 15% increase was seen, and between April 2013 to March 2014, 312 patients were seen on a monthly basis. This result was statistically significant ($p=0.006$). In the pre intervention period, anticoagulation visits accounted for roughly 50% of all visits. During the post intervention period, the anticoagulation visits accounted for 46% of all visits. This indicates that visits for other disease states (i.e. Diabetes, Heart Failure, Hypertension, etc.) increased between the pre and post intervention period. This

is further highlighted in figure 2, as the monthly average for visits regarding other disease states increased from 136 visits per month to 169 visits per month. This result is also statistically significant (p=.02).

The primary objective of this study was to assess the total number of anticoagulation visits pre and post intervention. At Acres Clinic, the monthly average of anticoagulation visits from the time period of August 2011 to March 2013 was 139 patients monthly. This number increased to 159 anticoagulation visits monthly during the post intervention period from April 2013 to March 2014 (p=0.15). At Northwest however, the increase was negligible from an average of 124 to 125 post intervention (p=0.90). At Settegast, a 6.3% increase was noted from 157 anticoagulation visits on a monthly basis to 167 anticoagulation visits on a monthly basis (p=0.50). At Strawberry, visits increased from 116 to 120 (p=0.76). On average a 6.7% increase in anticoagulation visits was seen pre and post intervention across all clinics, from 134 monthly anticoagulation visits post intervention to 143 monthly visits post intervention. However the results were not statistically significant (p=0.13).

Time to third available appointment, reflects the time for the next available appointment with the CLPS. Results are shown above in Table 2 for the average length of time in days. On average, at Acres clinic the time to next available appointment was roughly 15 days during the time period of October 2011 to March 2013. The time to third available appointment post intervention decreased from 15 days to 14 days (p=0.73). At Northwest, a 41% reduction in time to third available appointment was seen as the length of time decreased from 12 days to 7 days, which was a statistically significant result ($p < 0.001$).

A 25% reduction was noted from 12 days to 9 days at Settegast clinic. Finally at Strawberry, the length of time to third available appointment remained similar pre and post intervention at 14 days. Overall, across all clinics the pre-intervention average length of time to third available appointment decreased from 13.2 to 10.8, this was an 18% decrease which was not statistically significant (p=0.07).

A total of 501 patients were reviewed, 300 during the pre-intervention period and 201 during the post intervention period. Baseline characteristics of patients are noted in Tables 3 and 4. Overall, in the pre intervention group time in therapeutic range was 53.44% compared to 55.8% in the post intervention group as noted in Figure 1. The difference between the pre-intervention period and post intervention period was statistically significant (p= 0.04).

Patients who were hospitalized due to thromboembolic event or bleed, which corresponds to 10.6% compared to 6.95% in the post intervention group. The result was not statistically significant as noted in Figure 2 (p value= 0.15).

CSP Productivity is defined as total work hours over total picked up prescriptions. As shown in Table 5, no statistical difference was noted between clinic sites for productivity during the pre-intervention period compared to the post-intervention period.

In addition to CSP Productivity, CLPS were able to maintain current projects similar to project course load during the pre and post intervention period as shown in Figure 3.

Conclusion:

Results from the post intervention period were positive. An increase was noted in total anticoagulation visits; however the result was not statically significant. A 6.8% difference in total visits was noted compared to the projected 20% difference in total anticoagulation visits. There were several factors that could have contributed to the decreased difference margin. Enrollment into the telephone service was slow for several reasons. Many patients expressed to the CLPS that they preferred face to face visits or that they did not want to have a lab appointment. During CLPS visits, INR was obtained utilizing POC testing, however a lab appointment for INR would require a venipuncture. In addition, in the CSP telephone service, across all four clinics, a total of 43 patients were enrolled in the service. However, by March 2014 only 17 patients remained in the service. Appendix 5 highlights reasons for why patients were removed, the majority due to having more than two INR values outside of therapeutic range. Also, although 16 to 24 patient appointments were added to the CLPS schedule, these visits could be utilized for various disease states (i.e. diabetes, heart failure, hypertension, etc.) and were not limited to anticoagulation alone. This is further highlighted by Figure 2. As shown, total visits has increased by 15%, which was statistically significant ($p=0.006$), and visits for other disease states had increased between the two periods ($p=0.02$). CLPS Time to third appointment was noted to decrease across all clinics, however the result was not statistically significant. This may be due to moving patients into the telephone service and the additional available slots for CLPS patient visits. However, the only clinic with a significantly reduced time to third appointment was Northwest Clinic, therefore there may be other confounders affecting the statistical significance, which remain unknown.

As noted in the results, hospitalizations due to thromboembolic event remained similar in both groups, and therefore no statistical significance was seen. TTR was noted to increase in the post intervention group compared to those pre-intervention. Although the result was statistically significant, this result is not clinically significant as only a 2% change in TTR was seen. This change can possibly be attributed to differences in INR testing frequency and patient adherence to visits. The clinics were able to maintain clinical outcomes while expanding the clinical responsibilities of the CSPs. Productivity standards for both CLPS and CSP were maintained as noted in the results.

This study has several limitations. First of all, this study was unable to meet power as a 20% difference was not detected between the pre-intervention period and the post-intervention period. Slow enrollment is multi-factorial and illustrated in Appendix 3. In addition to aforementioned reasons, at particular sites, sponsoring agreements were difficult to render for CSP telephone anticoagulation service. For example, in certain clinics, long wait times and prescription volume burden caused sponsoring physicians to be hesitant of agreeing to a new initiative that would remove a CSP away from distributive functions for over an hour daily. It was at difficult at times for CSPs to step out of the workflow to conduct telephone interviews. In addition, utilization of POC testing by CSPs may have aided enrollment into the service, however was not available during the time of this study. In regards to clinical outcomes, although INR documentation and clinical protocol were similar across all sites, INR follow up may be

inconsistent or differentiate based on patient adherence to appointments and schedule placed by CLPS.

Increasing utilization of CSP and CLPS pharmacists in the outpatient setting allowed for expanded coverage in the anticoagulation. No change was noted in clinical outcomes and productivity measures were preserved, indicating that the increased workload did not hamper performance. When comparing this study to other studies noted in Table 6, we noted that the intervention required minimal training and setup. In comparison to other studies, such as Wittkowsky et al., and Witt et al. this study required minimal setup as training of CSP took roughly 1-2 weeks, the implementation of a telephone service took several months to create in the other studies. Therefore, we were able to expand coverage through minimal change to workflow and workload.

Further studies should evaluate expanding anticoagulation service from CLPSs to CSPs to see if clinical care can be maintained with a larger volume of patients. Due to slow enrollment, the telephone service was discontinued on April 1, 2014, and patients being seen by CSPs were returned to CLPS to be managed through CLPS. Additional projects have been taken to expand POC anticoagulation coverage through adding additional CLPS staff in various locations within the Harris Health System.

The obstacles, challenges and data obtained from the increased utilization period will greatly assist in the development of future steps needed to expand anticoagulation coverage and service for the Harris Health System and clinical duties for CSPs.

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List of Figures, Tables and Appendixes:

Appendix 1: Patient Enrollment for Telephone Encoutner Service	
Patients Referred to Telephone Service	Patients ineligible for Telephone Service
• Patients with three consecutive INRs within therapeutic range	• Patient less than 18 years of age • Patients discharged within the past 30 days from the hospital

Appendix 2: Removal of Patient from Telephone Encounter Servic

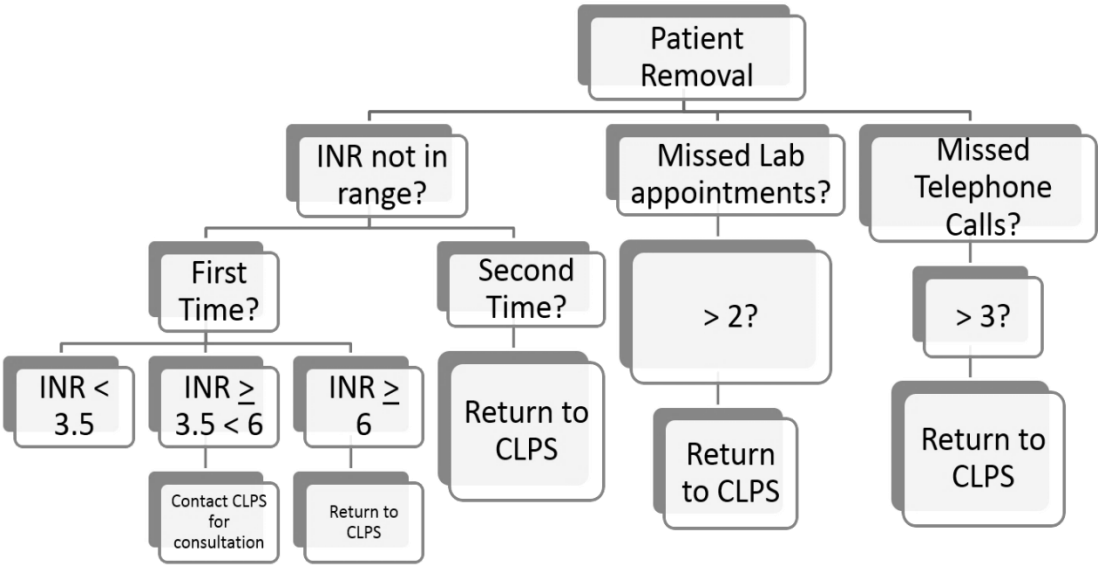


Figure 1: Treatment Arms

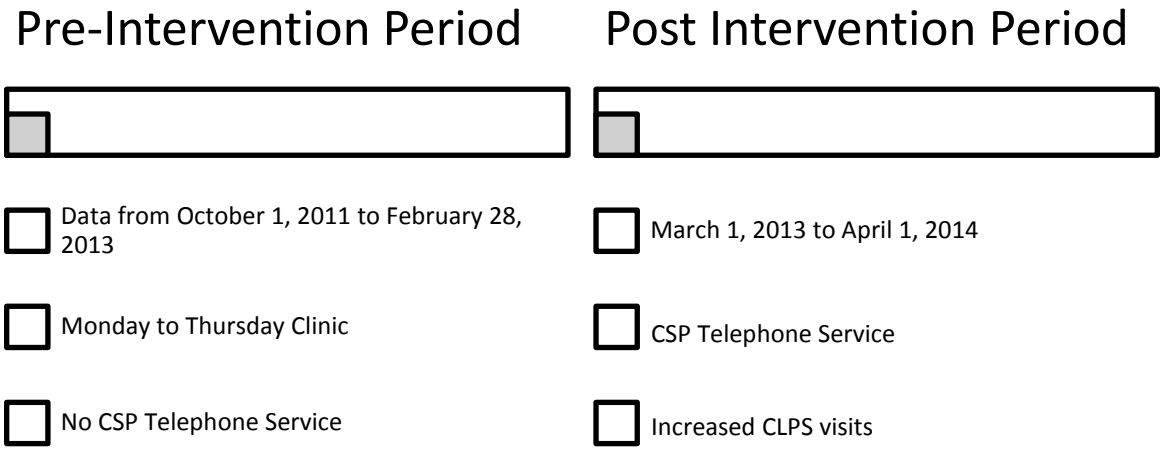


Figure 2: Total Number of Visits

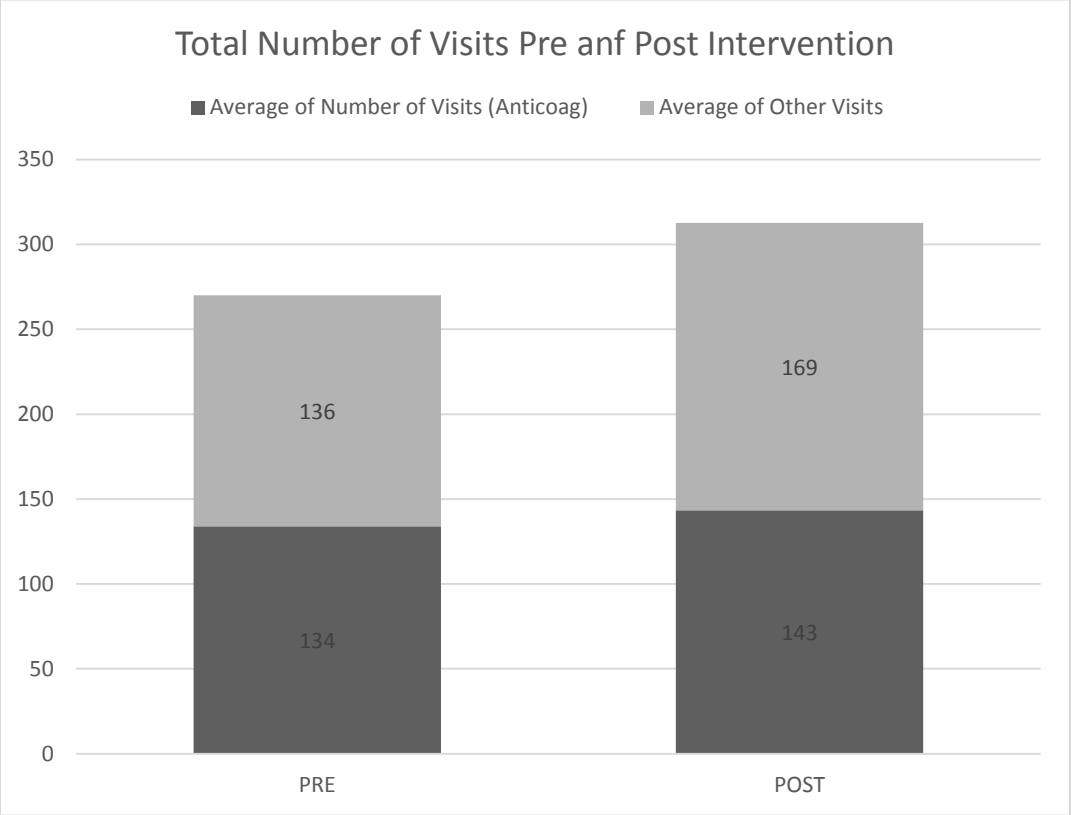


Table 1: Total Number of Anticoagulation Visits

Clinic	Pre-Intervention (Monthly Avg)	Post Intervention (Monthly Avg)	P-Value	CI
Acres	139	159	0.13	(-6.5 to 46.6)
Northwest	123	125	0.80	(-13.2 to 17)
Settegast	157	167	0.48	(-17.3 to 35.9)
Strawberry	116	122	0.59	(-17 to 29.4)
All Clinics	134	143	0.15	(-3.4 to 22)

Table 2: CLPS Time to Third Available Appointment (Days)

Clinic	Pre-Intervention (Monthly Avg)	Post-Intervention (Monthly Avg)	P-Value	CI
Acres	15	14	0.69	(-9.8 to 6.6)
Northwest	12	7	<0.001	(-7.8 to -2.3)
Settegast	12	9	0.22	(-7.3 to 1.75)
Strawberry	13.6	14	0.86	(-5.1 to 4.3)
All Clinics	13.2	10.8	0.07	(-5.13 to 0.217)

Table 3: Baseline Characteristics

Male (N)	147 *(49%)*	110 (55%)	.339
Female (N)	152 *(51%)*	91 *(45%)*	
Age in years (median)	59	61	
Ethnicity (N,%)			
White	51 *(17%)*	35 *(17%)*	.925
Black	107 *(36%)*	67 *(33%)*	
Hispanic	124 *(41%)*	89 *(45%)*	
Other	18 *(6%)*	10 *(5%)*	
Comorbidities (N,%)			
Diabetes	99 *(33%)*	61 *(30%)*	.846
Hypertension	211 *(70%)*	141 *(70%)*	.846
Hyperlipidemia	142 *(47%)*	91 *(45%)*	.585
Cancer	10 *(3.3%)*	10 *(4.9%)*	.100
Heart Failure	71 *(27%)*	54 *(18%)*	.417
Obesity	43 *(14%)*	22 *(11%)*	.269

Table 4: Baseline Anticoagulation Characteristics

Indications for Warfarin			
DVT	50 *(17%)*	21 *(10%)*	.03
Atrial Fibrillation	96 *(32%)*	75 *(37%)*	.24
PE	14 *(5%)*	3 *(2%)*	.63
MMVR/MAVR	58 *(19%)*	42 *(21%)*	.27
Lupus	10 *(3%)*	4 *(2%)*	.37
Protein S Def	5 *(2%)*	5 *(3%)*	.52
Length of Therapy-Indefinite	301	201	1
INR Goal			
2.0-3.0	239 *(79%)*	158 *(79%)*	.80
2.5-3.5	62 *(21%)*	43 *(21%)*	.80

Figure 2: TTR

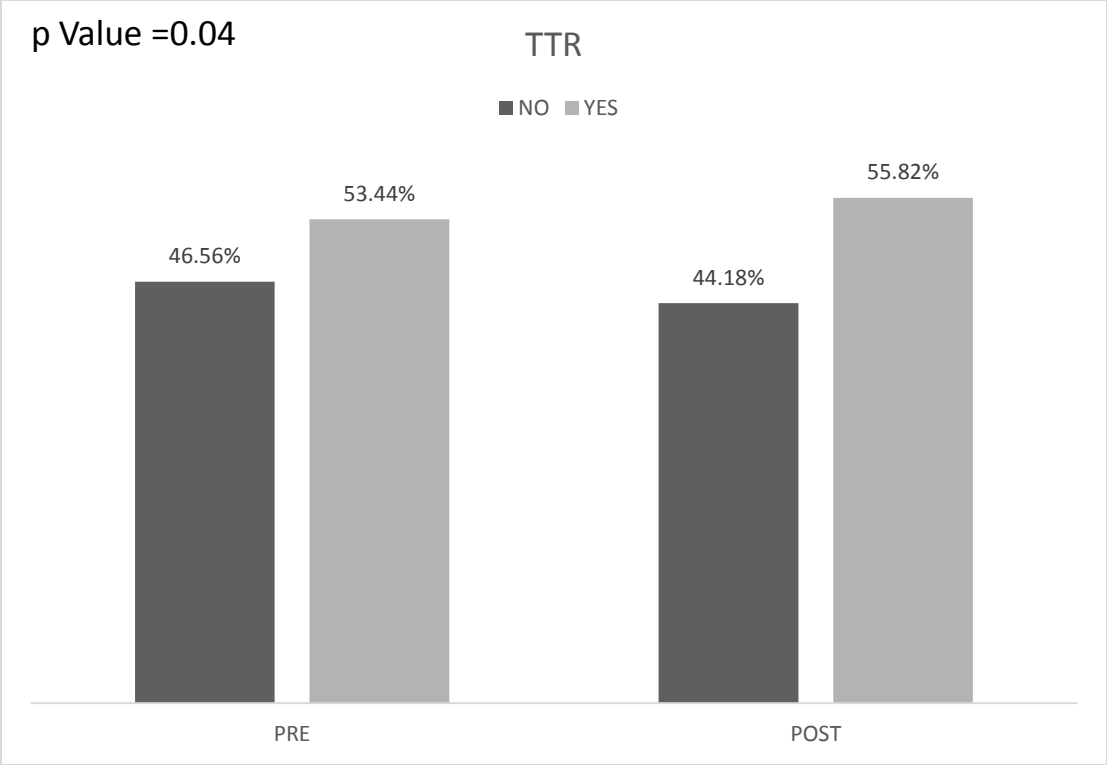


Figure 3: Hospitalizations due to Thromboembolic event or bleed

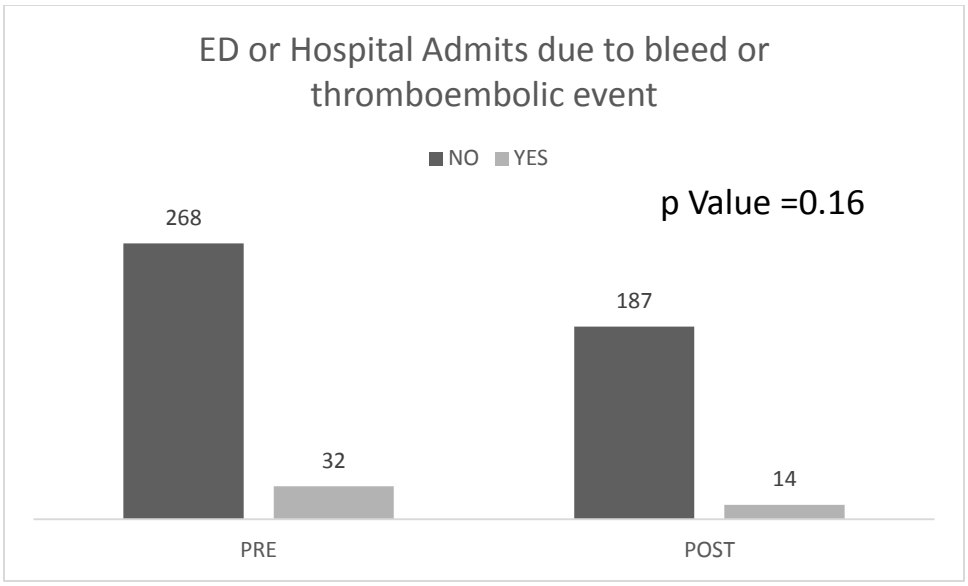
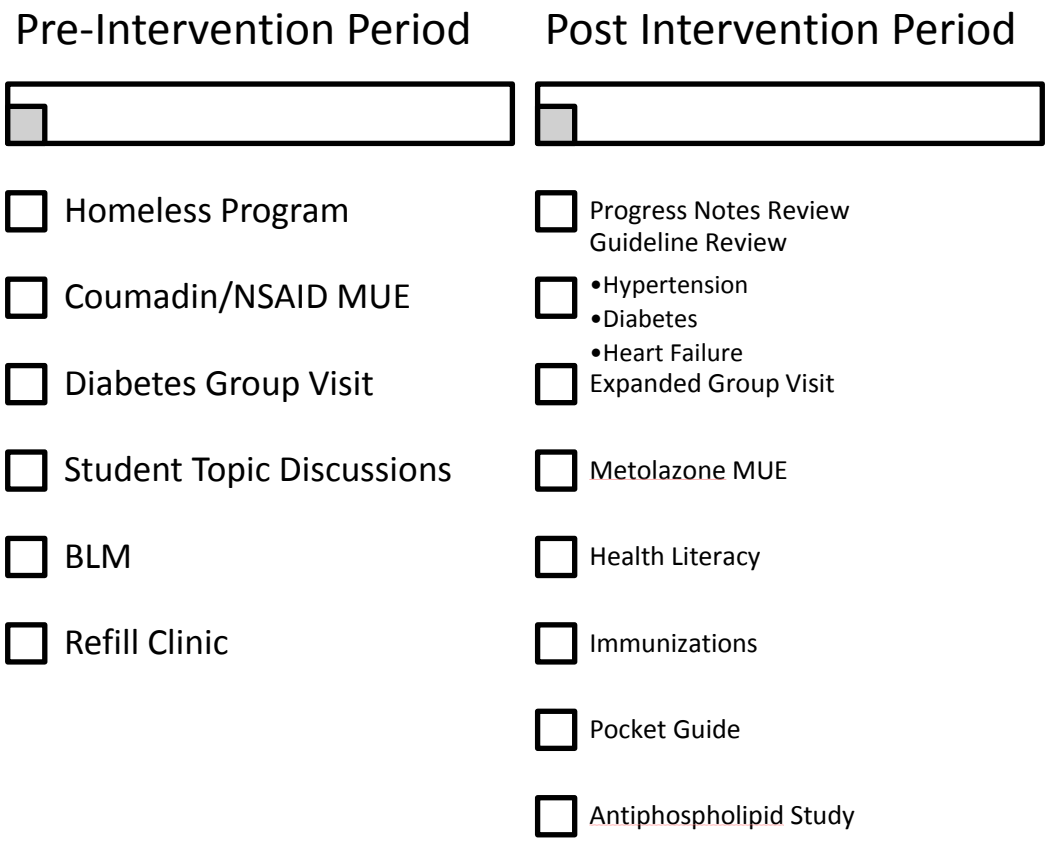


Table 5: CSP Productivity

Clinic	Pre-Intervention (Monthly Avg)	Post Intervention (Monthly Avg)	P-Value
Acres	.19	.20	0.17
Northwest	.22	.22	0.58
Settegast	0.21	0.22	0.92
Strawberry	.22	.22	0.85

Figure 8: CLPS Projects



Appendix 3: Telephone Service

Total Number of Patients in Telephone Service	43
Number of Months patients remained in service (avg)	4.5
Number of Patients Removed	26

Patients Removed	
Missed lab appointments	2
INR out of range	11
Patient Preference	3
No longer in Harris Health	4
Deceased	1
Hospitalization	2
Other	3

Table 6: Intervention Review

Article	Sample Size	Primary Outcome	Level	Intervention	Clinical Outcomes
Witt et al.[5]	N=6,645	Occurrence of anticoagulation related complication	Major	Creation of a clinical pharmacy anticoagulation service (CPAS). This is a telephone anticoagulation clinic involving clinical specialists, staff pharmacists and technicians. The team was also available by pager 24 h per day, 7 days per week.	• 30% less likely to experience anticoagulation event • Increased TTR in CPAS
Wittkowsky	N=234	Warfarin-related monitoring outcomes	Major	Telephone-based management had been selected for patients because they were unable to be seen in person due to physical disability, the inability to arrange or afford transportation, the fact that they lived a great distances from the clinic, or were unable to wait for a face-to-face visit and INR blood draws.	• TTR similar • Frequency of clinic visits similar • No statistical difference in bleed or thromboemobolic event
Philip et al.	N= 501	Number of anticoagulation visits	Minor	Increase number of available appointments for CLPS pharmacists Add a telephone service for patients consistently in therapeutic range, which was completed by CSP pharmacists	• Increase in number of anticoagulation visits, but not statistically significant • No difference in clinical outcomes of productivity

References:

1. Reta, A, Dashtaei, A, Sokkhim, L et al. ”Opportunities to improve clinical outcomes and challenges to implementing clinical pharmacists into health care teams.” *Prim Care*. 2012. 39(4).
2. Olson,K, Rasmussen, J, Sandhoff B. et al. Lipid management in patients with coronary artery disease by a clinical pharmacy service in a group model health maintenance organization. *Arch Intern Med.* 2005. 165(1):49-54
3. Wan Y, Heneghan C, Rafael P et al. Anticoagulation control and prediction of adverse events in patients with atrial fibrillation: a systematic review. *Circ Cardiovasc Qual Outcomes 2008*. 1:84.
4. Zareh,M., Davis, A., and Henderson,S. Reversal of Warfarin-Induced Hemorrhage in the Emergency Department. *West J Emerg Med*. 2011. 12(4): 386–392.
5. Witt DM, Sadler MA, Shanahan RL Effect of a Centralized Clinical Pharmacy Anticoagulation Service on the Outcomes of Anticoagulation Therapy. *Chest*. 2005. 127(5): 1515-1522.
6. Staresinic AG, Sorkness CA, Goodman BM et al., Comparison of Outcomes Using 2 Delivery Models of Anticoagulation Care. *Arch Intern Med*. 2006. 166(9):997
7. Wittkowsky AK, Nutescu EA, Blackburn J et al. Outcomes of Oral Anticoagulant Therapy Managed by Telephone vs. In-Office Visits in an Anticoagulation Clinic Setting. *CHEST*. 2006. 130:1385-1389

8. Rose AJ, Petrakis BA, Callahan P. et al., Organizational characteristics of high- and low-performing anticoagulation clinics in the Veterans Health Administration. *Health Serv Res*. 2012. 47(4):1541-60